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EV 665
1986
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Technical Memorandum

Lead Concentrations in Surface Soil on Residential Properties in the Vicinity of the Canada Metal Company, Toronto - 1985

Introduction

During July to October, 1985, the Phytotoxicology Section conducted an extensive soil sampling program on residential properties in the vicinity of the Canada Metal Company (CMC), 721 Eastern Avenue, Toronto. The purpose of the sampling was to determine those properties which had elevated soil lead levels. Personnel of the Toronto Department of Public Health have expressed the concern that soil lead levels above 1000 ppm may pose a potential danger to young children in direct contact with the soil.

Methods

All residential properties which lay within and generally slightly beyond the 1000 ppm soil lead isopleth, as generated by computer from results of previous sampling, were selected for sampling. The properties which were to be sampled number 407 in total. As a result of refusals, no suitable sampling areas, etc., the number of properties actually sampled was 389.

Soil sampling was conducted using standard phytotoxicology techniques. Usual sampling depth was 0-5 cm; shallower sampling (1-2 cm) was done at sites where packed and/or very coarse soil was encountered (e.g. on driveways). Two separate samples were collected at each site (duplicate sampling), and the results were averaged. A site consisted of a front yard, back yard, side yard (if of reasonable size), car parking area (usually a driveway), or distinct child's play area (where identified as such).

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The boulevard along Morse Street was sampled at intervals. Cultivated garden areas originally were to have been sampled where present to the exclusion of other suitable sampling areas such as lawns. However, garden areas were inadvertently excluded from sampling on 35 front or back yards (34 properties) where other suitable sampling sites were not present. These gardens will be sampled if requested.

In order to minimize contamination from peeling paint, soil cores were not collected closer than 0.5 m from painted exterior surfaces.

The total number of sites sampled was 716, or an average of 1.84 sites per property.

The samples were dried and sieved to 0.35 micrometre particle size, and were analyzed for lead at the MOE Resources Road Laboratory.

Results

Table 1 presents the results of the 1985 soil lead sampling program. Concentrations of lead in excess of 1000 ppm are underlined. Of the 389 properties sampled, 195 (50.1%) had one or more sample sites with greater than 1000 ppm lead in soil. The total number of sites (front yards, back yards, car parking areas, etc.) with greater than 1000 ppm lead was 266 (37.2% of the 716 sites sampled).

Eight properties (8 sites) revealed soil lead concentrations of greater than 2600 ppm, the soil replacement level recommended by the Environmental Hearing Board in 1976 (3000 ppm minus estimated 13% sampling and analytical error).

The maximum soil lead concentration measured in samples collected in 1985 was 10,200 ppm (car parking area behind a residence). The second highest level measured was 3600 ppm (back yard of a residence).

Soil Lead Levels on Properties Where Soil Was Replaced in 1976-78

In 1976-78, 49 residential properties near Canada Metal having soil lead exceeding 2600 ppm underwent soil replacement. A local nursery was contracted to remove 15 cm of contaminated soil and replace it with top soil containing no more than 200 ppm lead. The soil used for replacement was tested and was found to contain 7 ppm lead.

Soil lead concentrations increased from 1978 levels (post-replacement), with 13 of 65 sites in 1985 having soil lead in excess of 1000 ppm. Two sites which had undergone soil replacement had levels in 1985 which exceeded the former 2600 ppm replacement guideline.

Soil Lead Levels on Properties Where Soil Is
Not Known to Have Been Replaced - 1976 and 1985

A comparison of soil lead concentrations in 1976 was made with those in 1985 on properties where soil replacement is not known to have been conducted. The mean lead concentration for 198 sites decreased from 1538 ppm in 1976 to 1294 ppm in 1985, a 15.9% decrease. A decrease occurred at 147 sites (74%), while an increase or no change occurred at 51 sites (26%).

Summary

1. Of the 389 residential properties (716 sites) sampled, 195 properties (266 sites) had soil lead concentrations in excess of 1000 ppm.
2. Eight properties (8 sites) had soil lead exceeding 2600 ppm.
3. The sampling program was, for the most part, successful in delineating the 1000 ppm soil lead isopleths. Further sampling on Winnifred Avenue, Larchmount Avenue and Marigold Avenue would be required to identify the north limits of the zone.
4. On most properties where soil had been replaced in the 1970's, the 1985 testing program revealed higher lead levels than those measured immediately after soil replacement.
5. On most properties where soil had not been replaced in the 1970's (i.e. having less than 2600 ppm lead in 1976 testing), lead levels decreased from 1976 to 1985. The average decrease for 198 sites was 15.9%.

TABLE 1

Lead concentrations* in surface soil samples (0-5 cm depth) collected
in the South Riverdale residential neighbourhood - 1985.

Property Number		Front Yard	Back Yard	Other
1		230	580	
1	- boulevard			450
2		230	430	
3		510	<u>1100</u>	
4		570	N/A	
4	- boulevard			450
5		580	550	
5	- car park			820
6		360	paved	
7		480	paved	
7	- boulevard			580
8		500	N/A	
9		580	100	
10		580	520	
10	- car park			370 ^b
10	- boulevard			440
11		720	640	
12		460	620	
12	- car park			<u>2780</u> ^b
13		700	860	
13	- boulevard			590
14		860	630	
14	- car park			640
15		670	650	
15	- car park			<u>1150</u> ^b
16		860 ^c	670 ^c	
16	- boulevard			520
17		N/A	N/A	
17	- car park			800 ^b

Table 1: Continued

Property Number		Front Yard	Back Yard	Other
18		990	430	
18	- car park			<u>1450</u> ^b
19		690	590	
20		<u>1100</u>	<u>920</u> ^{ab}	
20	- car park			<u>1010</u> ^b
21		<u>1020</u>	500	
21	- back near lane			<u>1150</u>
22		<u>1250</u>	new fill	
23		paved	450	
24		<u>1000</u>	100	
24	- car park			990 ^b
25		850	760	
26		<u>1060</u>	620	
27		paved	car park	
27	- car park			880
27	- near lane			880
28		paved	N/A	
29		<u>1000</u> ^d	N/A	
30		N/A	N/A	
31		paved	680 ^b	
32		<u>1050</u>	940 ^b	
32	- car park			880 ^b
33		N/A	340 ^{ab}	
34		paved	440	
35		960	920 ^a	
36		paved	garden	
37		paved	640	
38		paved	<u>1000</u>	
39		paved	750	
40		<u>1300</u>	670	
41		<u>1200</u>	260	

Table 1: Continued

Property Number	Front Yard	Back Yard	Other
42	<u>1150</u>	830	
43	<u>640^b</u>	590	
43	- car park		<u>630^b</u>
44	<u>1600</u>	<u>1100</u>	
45	<u>1250</u>	840	
46	<u>1100</u>	<u>440^b</u>	
47	<u>1100</u>	<u>1450^b</u>	
48	<u>1600</u>	<u>1150^a</u>	
49	<u>1150</u>	<u>1080</u>	
50	960	paved	
51	N/A	460	
52	paved	<u>1150</u>	
53	paved	paved	
54	570	720	
55	610	670	
56	490	840	
57	450	<u>530^a</u>	
58	490	990	
59	340	980	
60	600	850	
61	660	940	
62	660	750	
62	- laneway		<u>1740^b</u>
63	garden	garden	
64	880	990	
65	<u>530^b</u>	<u>1050</u>	
66	970	<u>730^b</u>	
67	650	garden	
68	<u>1300</u>	680	
69	<u>1100</u>	780	
70	860	720	

Table 1: Continued

Property Number		Front Yard	Back Yard	Other
71		670	620	
72		970	560	
72	- car park			910 ^b
73		170	630	
74		920	garden	
75		770	620	
76		740	640	
77		850	470	
78		840	450	
79		520	240	
79	- car park			650 ^b
80		790	N/A	
81		new sod	<u>1100</u>	
82		<u>1040</u>	790	
83		<u>1030</u>	N/A	
84		640	350	
85		770	garden/paved	
86		950	770	
87		850	690	
88		610	640	
89		640	640	
90		570	720	
91		710	N/A	
92		530	500	
93		610	paved	
94		<u>1050</u>	<u>1400</u>	
95		810	<u>2050</u> ^b	
96		690	560	
97		550	580 ^b	
98		540	580 ^b	
99		570	580	

Table 1: Continued

Property Number	Front Yard	Back Yard	Other
100	210	80	
101	180	N/A	
102	250	230	
103	220	170	
104	340	230	
105	paved	paved	
106	paved	paved	
107	paved	N/A	
108	paved	<u>1100</u>	
109	paved	<u>1150</u>	
110	paved	<u>1250</u>	
111	330	garden/paved	
112	370	garden/paved	
113	<u>2260</u>	gravel	
113	- side yard		<u>2850</u>
114	<u>1150</u>	970	
115	<u>1050</u>	N/A	
116	<u>1350</u>	N/A	
117	construction	<u>2000</u>	
118	construction	700	
119	930 ^b	700	
120	430 ^b	740	
121	880 ^b	<u>1200</u>	
122	<u>1100</u>	<u>1200</u>	
123	770 ^b	<u>1200</u>	
124	<u>1100</u>	N/A	
125	paved	660	
125	- play area		950 ^a
126	paved	<u>1200</u>	
127	570	<u>1900</u> ^b	
127	- side yard		<u>2260</u>

Table 1: Continued

Property Number		Front Yard	Back Yard	Other
128		new soil	<u>2260</u> ^b	
129		940	<u>1100</u>	
130		<u>1050</u>	garden	
131		<u>1040</u>	N/A	
132		<u>1100</u>	garden	
133		680	850 ^b	
133	- car park			570 ^b
134		680	<u>1100</u>	
135		430	900	
136		<u>1350</u>	N/A	
136	- car park			420 ^b
137		<u>1100</u>	<u>1250</u>	
137	- side yard			<u>1350</u>
138		<u>1050</u>	garden	
149		740	<u>1000</u>	
140		650	N/A	
141		780	paved	
142		280	680	
143		920	610	
144		920	paved/gravel	
145		880	460 ^b	
146		610	paved	
147		<u>1250</u>	360	
148		900	gravel	
149		770	490	
150		500	550	
151		420	garden/paved	
151	- car park			400 ^b
152		370	N/A	
152	- side yard			670
153		450	garden/paved	

Table 1: Continued

Property Number	Front Yard	Back Yard	Other
154	<u>1500</u>	<u>1050</u>	
155	<u>1950</u>	200	
156	<u>1400</u>	<u>1100</u>	
157	garden	950 ^{ab}	
158	<u>1100</u>	<u>1200</u>	
158	- car park		890 ^b
159	<u>1000</u>	900	
160	760	garden/paved	
160	- car park		<u>3150</u> ^b
161	<u>1000</u>	paved	
161	- car park		770 ^b
162	<u>1040</u>		
162	- car park		<u>1500</u> ^b
163	<u>1150</u>	N/A	
164	750	paved	
165	<u>1100</u>	880	
166	300	140	
167	250	420 ^b	
168	<u>1650</u>	890	
168	- side yard		<u>2300</u>
169	<u>1900</u>	830 ^b	
170	<u>1200</u>	N/A	
171	<u>1450</u>	<u>1300</u>	
172	920	N/A	
173	<u>1150</u>	720	
174	520 ^b	580	
175	<u>1100</u>	<u>1050</u>	
176	860	690	
177	380	garden	
178	constuction	610	
179	370	640	

Table 1: Continued

Property Number	Front Yard	Back Yard	Other
180	560	990	
181	<u>1040</u>	230	
182	800	patio	
183	840	440	
184	780	<u>1050</u>	
185	560	710	
186	paved	paved	
186	- side yard		<u>1950</u>
187	<u>1950</u>	N/A	
188	280	refused	
188	- between 188 & 189		<u>1250</u>
189	<u>1000</u>	N/A	
190	<u>1150</u>	<u>2050</u>	
191	<u>1150</u>	<u>2200</u>	
192	<u>1550</u>	<u>1200</u>	
193	paved	940	
194	<u>1300</u>	<u>1050</u>	
195	<u>1050</u>	<u>1550</u>	
196	<u>1150</u>	garden	
197	<u>1350</u>	980	
198	640	370	
199	760	garden/paved	
200	<u>1150</u>	<u>1040</u>	
201	300	paved	
201	- side yard		740
202	<u>1300</u>	<u>1550</u>	
203	370	<u>1280^a</u>	
204	240	<u>1100</u>	
205	<u>1740</u>	<u>1200</u>	
206	280	<u>1650^b</u>	
207	<u>1100</u>	<u>1350</u>	

Table 1: Continued

Property Number		Front Yard	Back Yard	Other
208		<u>1050</u>	280	
209		<u>1450</u>	<u>1050</u>	
210		<u>1100</u>	940 ^a	
211		<u>1650</u>	980	
212		<u>1400</u>	960	
213		refused	refused	
214		<u>1850</u>	<u>1060</u>	
215		960	<u>1150</u>	
216		<u>2000</u>	980	
216	- side yard			<u>3200</u>
217		<u>1050</u>	990	
218		<u>1100</u>	N/A	
219		340 ^b	N/A	
220		330 ^b	N/A	
220	- between 220 & 221			630 ^b
221		370	<u>1550</u>	
222		650	<u>1300</u>	
222	- between 222 & 223			<u>2250</u>
223		<u>1600</u>	<u>1250</u>	
224		<u>1150</u>	paved	
225		930	garden	
226		400	<u>1400</u>	
226	- between 226 & 227			<u>1500</u>
227		<u>1100</u>	380	
228		260 ^b	<u>1020^b</u>	
229		350 ^b	garden/paved	
230		<u>1300</u>	paved	
231		840	paved	
232		<u>1100</u>	paved	
232	- between 232 & 233			<u>1200</u>
233		940	<u>1000</u>	
234		<u>1050</u>	refused	

Table 1: Continued

Property Number	Front Yard	Back Yard	Other
235	510	260 ^a	
236	830	710	
236	- between 236 & 237		620
237	540	garden/paved	
238	750	garden/paved	
239	570	brick chips	
240	<u>1000</u>	<u>1700</u>	
241	980	N/A	
242	<u>1150</u>	760	
242	- between 242 & 243		950 ^b
243	460 ^b	660	
244	610 ^b	garden/paved	
244	- between 244 & 245		460 ^b
245	600	garden/paved	
246	bin on lawn	paved	
247	<u>1570</u>	610	
247	- side yard		840
248	740	550	
249	<u>2300</u>	660	
249	- car park		<u>10200^b</u>
250	<u>2500</u>	<u>1500</u>	
251	<u>2550</u>	garden/paved	
252	420	<u>1550</u>	
253	<u>1800</u>	<u>1800</u>	
254	<u>1650</u>	<u>1550</u>	
255	<u>1600</u>	<u>1040</u>	
256	<u>1350</u>	car park	
256	- car park		860
257	<u>1150</u>	gravel	
258	<u>2000</u>	<u>3600</u>	
259	440	970	

Table 1: Continued

Property Number		Front Yard	Back Yard	Other
260		<u>1050</u>	<u>1900</u>	
261		<u>1550</u>	450	
262		<u>1100</u>	820	
263		<u>1250</u>	780	
264		<u>1550</u>	<u>1850</u>	
265		<u>1000</u>	<u>1000</u>	
266		930	810	
267		880	<u>1050</u>	
268		820	650	
269		760	570	
270		940	590	
271		940	<u>1100</u>	
272		900	910	
272	- car park			700 ^b
273		610	car park	
274		710	refused	
275		550	190	
275	- car park			620 ^b
276		700	130	
277		540	paved	
278		500	gravel	
279		370	320	
280		320	N/A	
281		N/A	N/A	
282		<u>3250</u>	(1950)	
282	- side yard			<u>1950</u>
283		<u>2200</u>	N/A	
283	- car park			<u>1800^b</u>
284		320	330	
285		<u>1200</u>	garden/paved	
285	- car park			980 ^b

Table 1: Continued

Property Number	Front Yard	Back Yard	Other
286	<u>1300</u>	N/A	
287	640	garden/paved	
287	- car park		670 ^b
288	new sod	<u>1750</u>	
289	<u>1750</u>	<u>1350</u>	
290	<u>1550</u>	<u>1550</u>	
291	<u>1550</u>	<u>1100</u>	
292	<u>1350</u> ^b	<u>1000</u>	
293	<u>1600</u>	910	
294	<u>1300</u> ^b	910	
295	<u>1000</u>	refused	
296	650	840	
297	<u>1100</u>	920	
298	950	960	
299	<u>1210</u>	<u>1600</u>	
300	980	car park	
300	- car park		860 ^b
301	890	garden/paved	
302	720	720	
303	850	paved	
304	960	<u>1000</u>	
305	<u>1100</u>	430	
305	- car park		480 ^b
306	450	570	
307	440	500 ^b	
308	450	300	
309	640	500	
310	410	240	
311	980	N/A	
312	<u>1050</u>	<u>2000</u>	
313	<u>1750</u>	210	

Table 1: Continued

Property Number	Front Yard	Back Yard	Other
314	830	920	
315	970	<u>1150</u>	
316	750	paved	
317	850	730 ^b	
318	790	860	
319	<u>1400</u>	820	
320	640	890	
321	460	650	
322	780	490	
323	760	paved	
324	640	610	
325	750	820	
326	510	paved	
327	refused	refused	
328	670	850	
329	560	840 ^b	
330	480	760 ^b	
331	710	950	
332	790 ^b	N/A	
332	- side yard		<u>1210^b</u>
332	- S boulevard		<u>1450^b</u>
333	960 ^b	<u>1050^b</u>	
334	920 ^b	car park	
334	- car park		<u>1520</u>
335	940 ^b	980 ^b	
336	820	900	
337	610	460 ^b	
338	370	380 ^b	
339	660 ^b	car park	
339	- car park		<u>1550^b</u>
340	660 ^b	900 ^b	

Table 1: Continued

Property Number	Front Yard	Back Yard	Other
341	<u>1300</u>	<u>2950^b</u>	
342	<u>1020</u>	<u>1150</u>	
343	<u>1100</u>	<u>1600</u>	
344	<u>1100^b</u>	<u>1100</u>	
345	<u>710^b</u>	garden	
346	980	<u>1850</u>	
347	no yard	(1850)	
348	<u>1150</u>	<u>1450</u>	
348	- 2nd back yard		<u>1350</u>
349	840	<u>1700</u>	
350	<u>1600</u>	260	
351	garden	refused	
351	- car park		620 ^b
352	garden	210	
353	420	410	
354	800	650	
354	- between 357 & 358		<u>1050</u>
355	640	no yard	
355	- car park		<u>1300^b</u>
356	660	660	
357	910	refused	
358	refused	refused	
359	980	<u>1650^b</u>	
360	820	770	
361	740	paved	
361	- car park		230 ^b
362	470	570	
363	610	490	
364	paved	paved	
365	paved	820 ^b	
366	990	550	

Table 1: Continued

Property Number		Front Yard	Back Yard	Other
367		990	N/A	
368		790	N/A	
368	- side yard			<u>1350</u>
369		680	980	
369	- side yard			<u>1500^b</u>
370		<u>1650</u>	paved/debris	
371		410	<u>1100</u>	
372		500	310 ^b	
373		910	950	
374		garden/paved	<u>1050</u>	
375		710	gravel	
375	- car park			720 ^b
376		610	patio	
376	- side yard			630
377		garden	paved	
378		<u>1050</u>	<u>1300</u>	
378	- side yard			<u>1300</u>
379		paved	garden	
380		paved	850	
381		<u>1900</u>	N/A	
382		<u>1900</u>	N/A	
383		520	<u>1650</u>	
384		<u>1150</u>	430	
385		360	<u>1900</u>	
386		600	<u>1150</u>	
387		<u>1650</u>	<u>1650</u>	
388		490	<u>1300</u>	
388	- between 388 & 389			370
389		640	<u>1500</u>	
390		<u>2550</u>	800 ^b	
391		<u>2500</u>	<u>1200</u>	

Table 1: Continued

Property Number		Front Yard	Back Yard	Other
391	- car park			710 ^b
392		670	garden/paved	
393		<u>2350</u>	N/A	
394		<u>2000</u>	<u>1010</u>	
395		new sod	paved	
396		<u>1950</u>	<u>2150</u>	
397		<u>1400</u>	790	
397	- side yard			<u>1600</u>
397	- car park			840 ^b
398		630 ^b	380	
399		brick chips	paved	
400		<u>1300</u>	paved	
401		310	600	
401	- between 401 & 402			660
402		<u>1750</u>	<u>2450</u>	
403		500	<u>1700</u>	
403	- between 403 & 404			340
404		810	<u>1300</u>	
405		<u>1040</u>	<u>1700</u>	
406		710	560	
407		<u>1500</u>	<u>1600</u>	

* Concentrations are ug/g, dry weight, average of duplicate field samples. Underlined values exceed 1000 ug/g.

N/A = Sample not available or no access to yard

a Sample location identified as play area

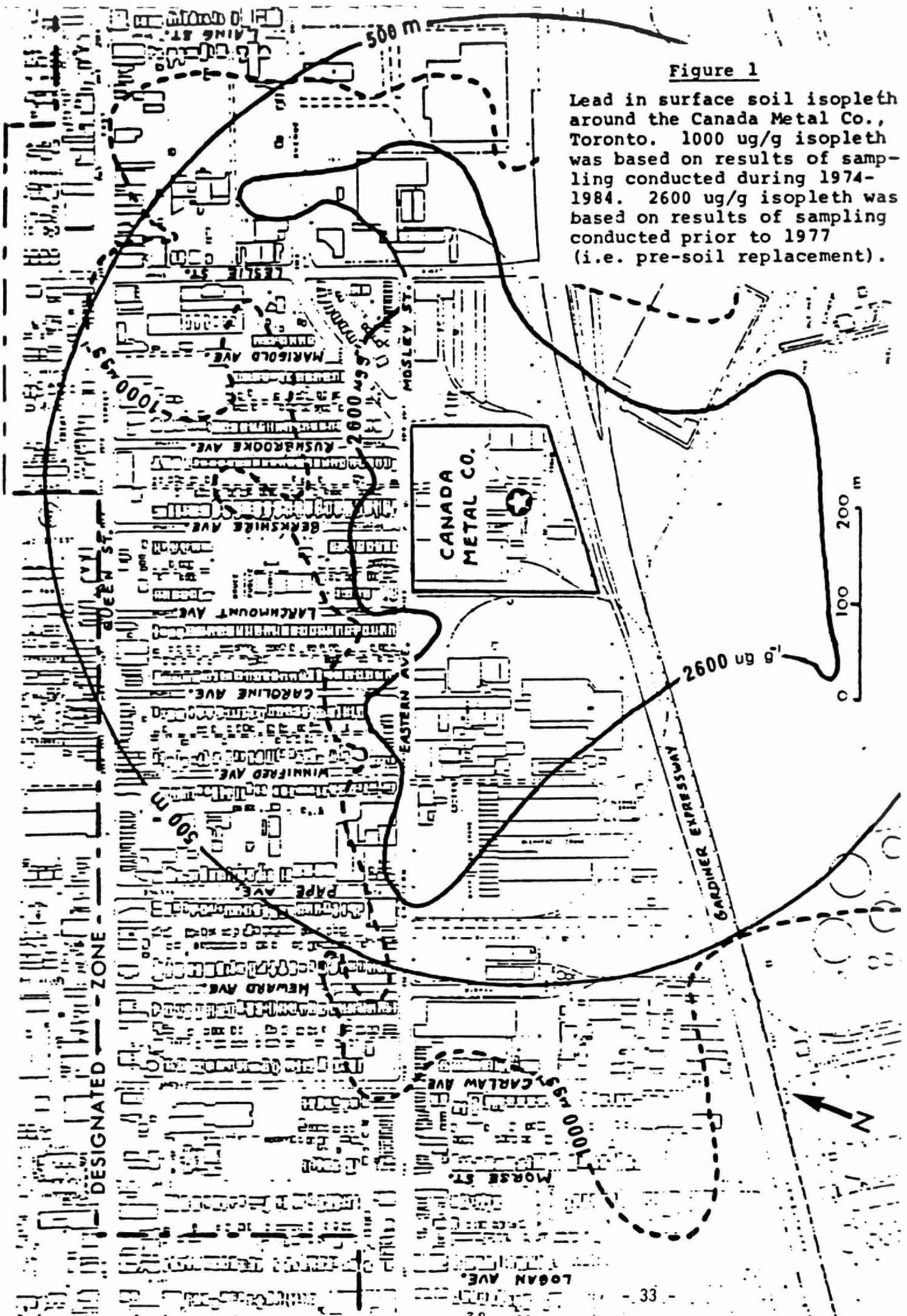
b Sampling depth approx. 0-2 cm

c Garden soils sampled

d 1984 result

Figure 1

Lead in surface soil isopleth around the Canada Metal Co., Toronto. 1000 ug/g isopleth was based on results of sampling conducted during 1974-1984. 2600 ug/g isopleth was based on results of sampling conducted prior to 1977 (i.e. pre-soil replacement).



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